United States Patent [19]

Stupakis

[11] **Patent Number: 4,778,216**

[45] **Date of Patent: Oct. 18, 1988**

[54] **LIGHTWEIGHT TRANSPORTABLE DENTAL CHAIR**

[75] Inventor: **John S. Stupakis,** Arcadia, Calif.

[73] Assignee: **JSS Scientific Corporation,** Arcadia, Calif.

[21] Appl. No.: **40,024**

[22] Filed: **Apr. 20, 1987**

[51] **Int. Cl.**[4] **A47C 3/20;** A47C 4/52; A47C 4/54

[52] **U.S. Cl.** **297/17;** 248/157; 248/631; 297/345; 297/DIG. 3; 297/DIG. 8

[58] **Field of Search** ..... 297/17, 345, DIG. 3, 297/DIG. 8; 248/157, 161, 188.6, 188.7, 631

[56] **References Cited**

U.S. PATENT DOCUMENTS

271,596	2/1883	Browne .	
1,373,079	3/1921	King	297/345
2,397,766	4/1946	Tullis	248/188.6 X
2,731,652	1/1956	Bishop	297/DIG. 3
3,112,956	12/1963	Schick et al.	297/219
3,179,465	4/1985	Roberts	297/17
3,419,309	12/1968	Smith	297/17 X
3,682,431	8/1972	Vivian	248/631
3,909,061	9/1975	Johnson	297/17
4,504,989	3/1985	Maltz	5/455
4,538,854	9/1985	Wilson	297/DIG. 8

FOREIGN PATENT DOCUMENTS

241818	11/1962	Australia	248/631
3119867	12/1982	Fed. Rep. of Germany	297/DIG. 8
2333472	7/1977	France	297/345
2550070	2/1985	France	297/17
178937	11/1982	Japan	297/DIG. 3

Primary Examiner—Kenneth J. Dorner
Assistant Examiner—Peter Brown
Attorney, Agent, or Firm—John G. Mesaros

[57] **ABSTRACT**

A field portable dental chair, collapsible to suitcase size, with pivotable outriggers for support, the chair including a bellows arrangement with a telescopic internal structure for raising and lowering the seat of the chair. The apparatus is formed, in part, of rigid members and, in part, flexible members contained within the rigid members for portability. Inflatable cushion members are provided for support of the head, back, seat and legs of a patient.

20 Claims, 2 Drawing Sheets

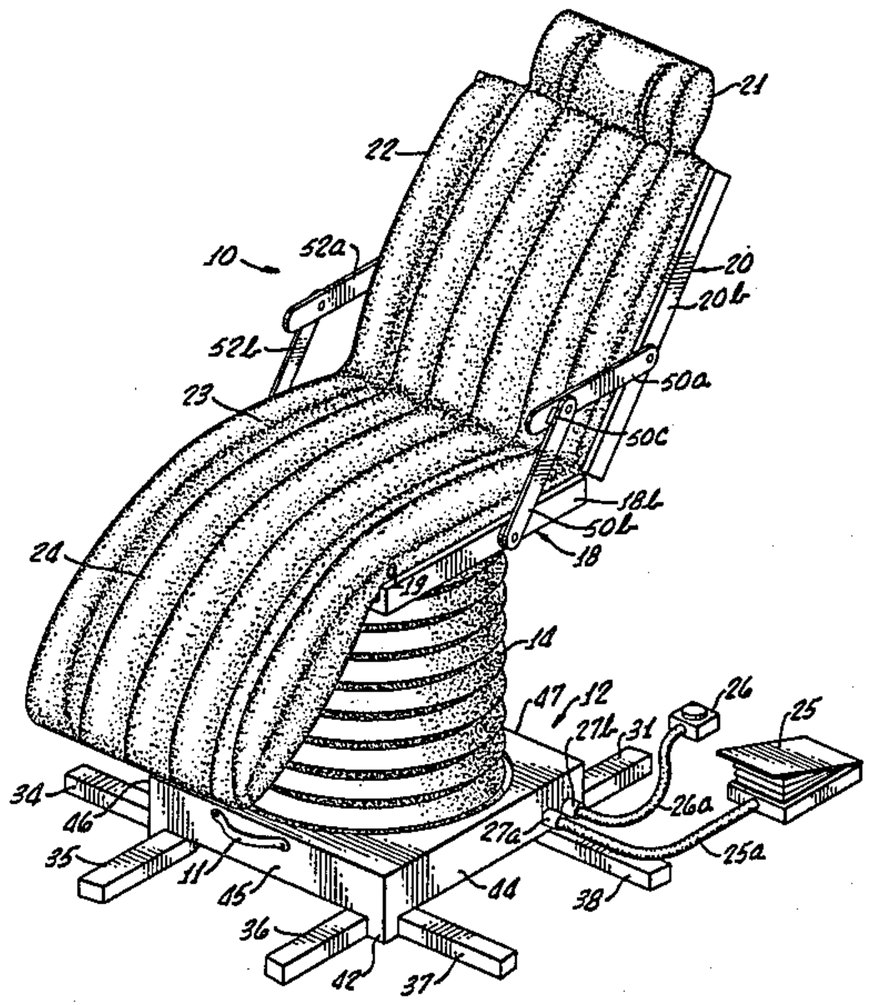


FIG. 1.

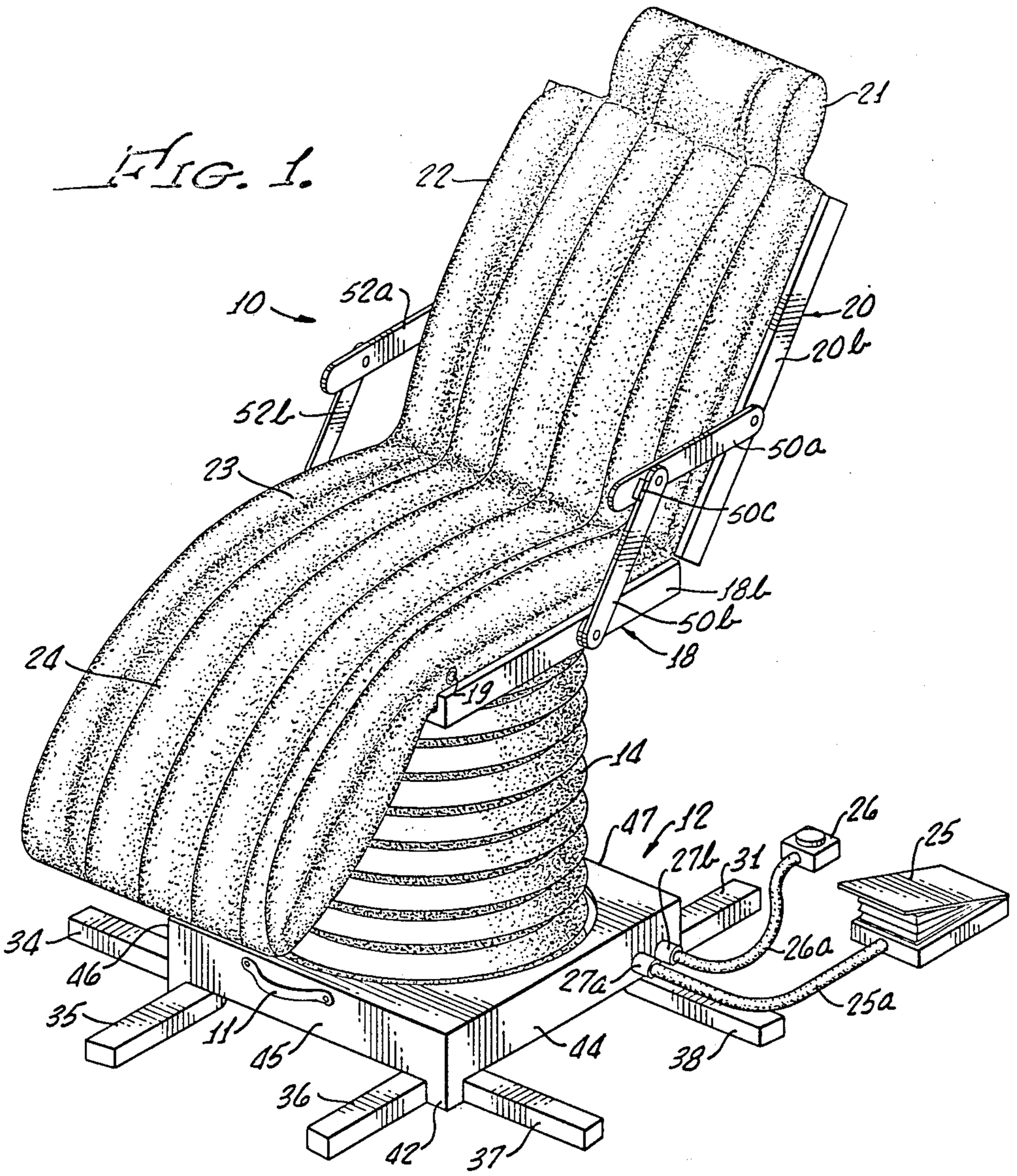
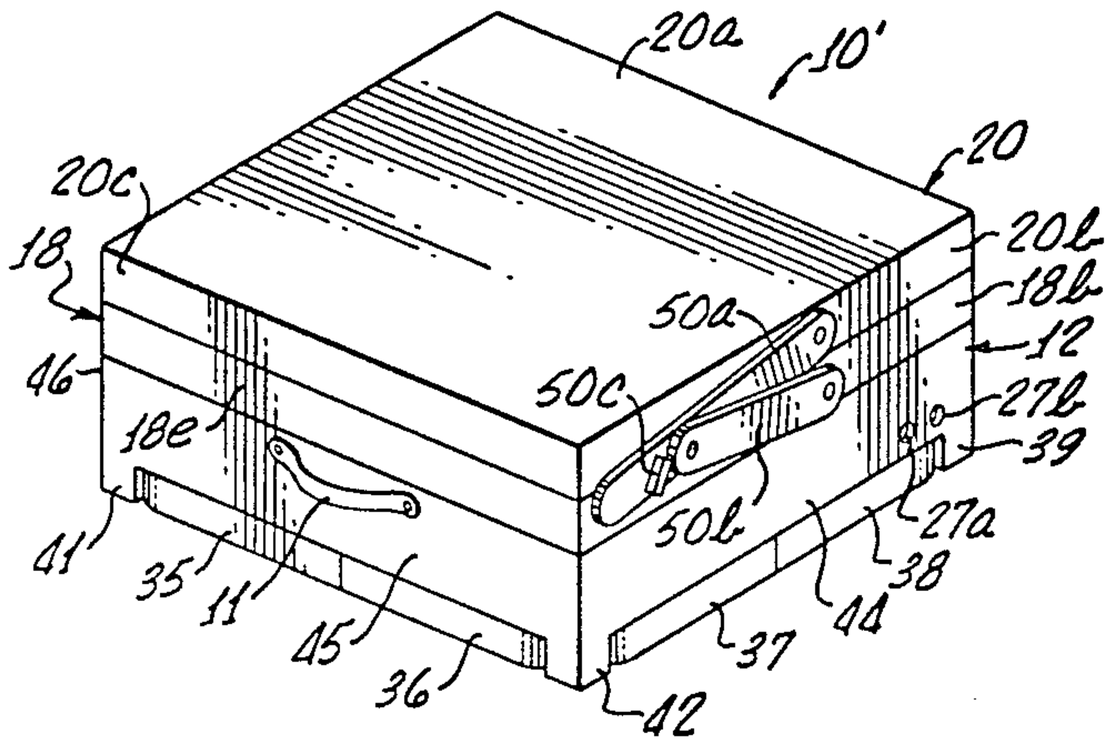


FIG. 4.



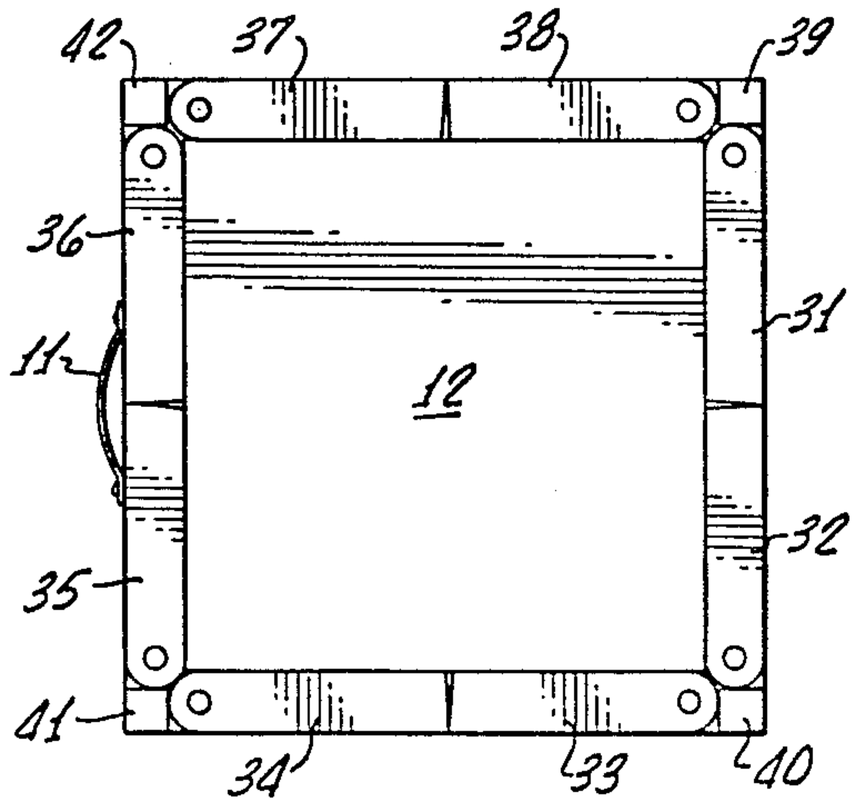


FIG. 5.

FIG. 2.

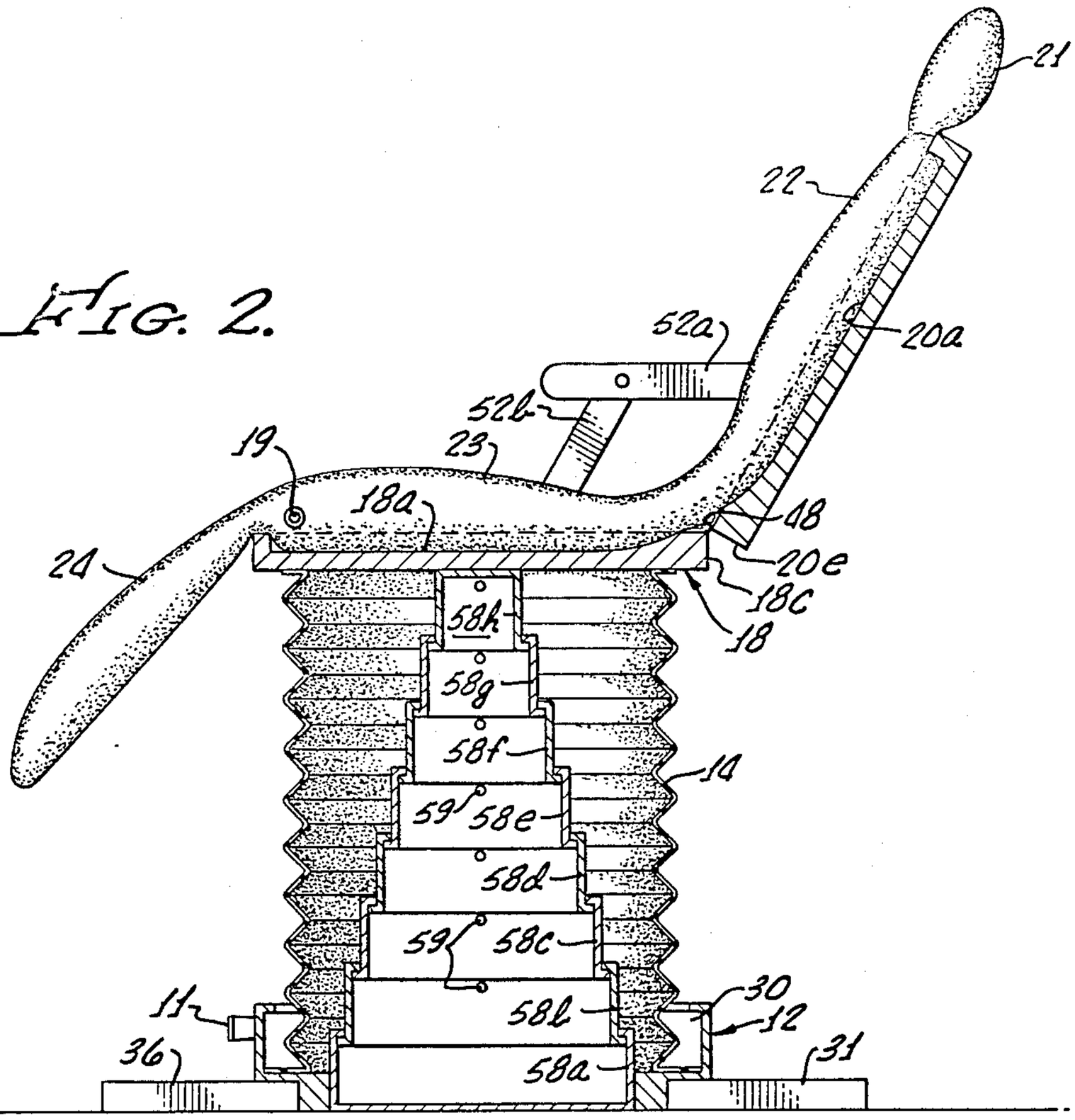
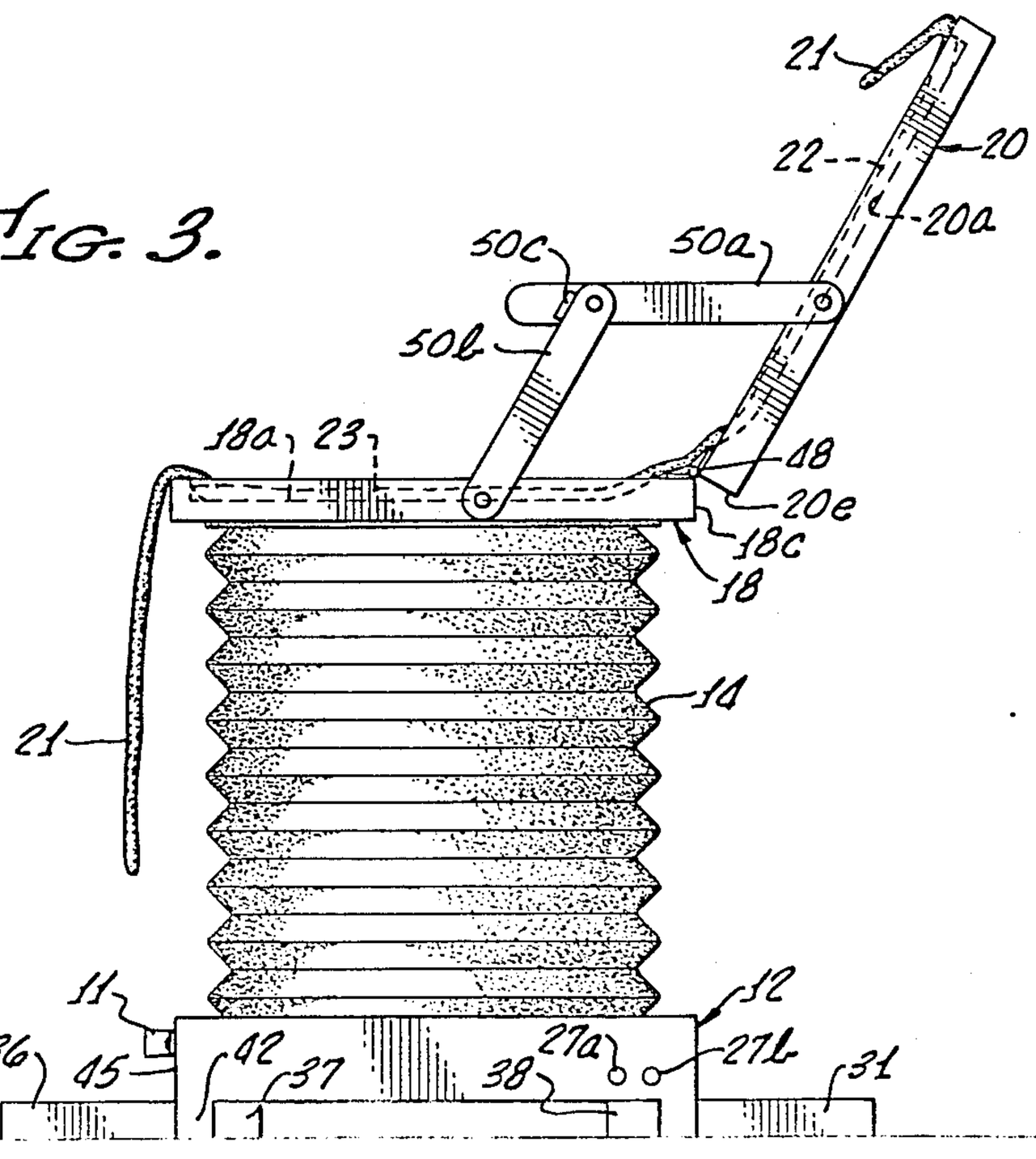

21
22
52a
20a
52b
19
23
18a
18
20e
18c
18
21
58h
58g
58f
14
59
58e
58d
59
58c
11
58b
30
12
36
58a
31

FIG. 3.


21
22
20
20a
50c
50a
50b
18a
23
18
20e
18c
18
14
21
11
12
36
45
42
37
38
27a
27b
31

LIGHTWEIGHT TRANSPORTABLE DENTAL CHAIR

BACKGROUND OF THE INVENTION

The background of the invention will be discussed in two parts.

FIELD OF THE INVENTION

This invention relates to dental chairs, and more particularly to a lightweight, transportable dental chair, collapsible into the size of a suitcase.

DESCRIPTION OF THE PRIOR ART

Dental chairs are typically huge, bulky mechanized arrangements, requiring electrical machine driven sources of air or hydraulics for operation. In many environments, such as for field military use, or in remote locations in third world countries, medical and dental supplies and equipment have to be transported in wheeled vehicles or airplanes, and sometimes on foot or by pack animals. In such instances space and weight requirements dictate against the use of such conventional dental chairs.

A prior art folding dental chair is shown and described in U.S. Pat. No. 271,596, issued to Browne on Feb. 6, 1883, the chair being formed of interconnected pivotably attached barshaped members supporting a seat, back and footrest, with ratchet bars on the base portion for providing height adjustment.

A "Collapsible Seat" is disclosed in U.S. Pat. No. 3,419,309, which issued to Smith on Dec. 31, 1968, the seat being configured as a suitcase enclosure, with inflatable cushion members therein.

Another such suitcase apparatus is disclosed in U.S. Pat. No. 3,179,465, "Convertible Beach Chair-Suit case Combination", such patent issuing on Apr. 20, 1965 to Roberts. The suitcase is configured for enclosing therein tubular rigid frame members pivotally attached to the interior of the suit case structure.

An "Elevator Chair" is disclosed in U.S. Pat. No. 4,538,854, which issued to Wilson on Sept. 3, 1985, such patent disclosing a chair having a seat portion with an inflatable bag under the seat portion, with a vacuum device housed within the inflatable bag for providing air to the interior thereof. Sliding support members are provided at the corners of the seat.

Inflatable devices are shown and described in U.S. Pat. No. 3,112,956, entitled "Inflatable Seat and Back Rest", which issued to Schick et al. on December 3, 1963; and U.S. Patent No. 4,504,989, entitled "Inflatable Support Arrangement", which issued to Maltz on Mar. 19, 1985.

In accordance with an aspect of the invention, it is accordingly an object of the invention to provide a new and improved lightweight dental chair comprised of rigid and inflatable parts, and which may be collapsed into a suitcase size.

SUMMARY OF THE INVENTION

The foregoing and other objects of the invention are accomplished by providing afield portable dental chair, which, in its collapsed position, is configured as a suitcase with a handle for portability. The base portion of the suitcase is generally rigid and is provided on the bottom exterior with pivotable outriggers for support, while the box-like interior forms a compartment for housing a bellows arrangement for raising and lowering

the chair, with a telescopic internal structure for stabilization. A seat and seat back are hingedly coupled, and have generally rigid tray-shaped configurations to form an enclosure with an inflatable cushion contained therein, inflation of which provides support for the head, back, seat and legs of a patient.

Other objects, features and advantages of the invention will become readily apparent from a reading of the specification, when taken in conjunction with the drawings, in which like reference numerals refer to like elements in the several views.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the dental chair apparatus according to the invention, set up, inflated and ready for use;

FIG. **2** a side elevational view of the dental chair apparatus of FIG. **1**, partially broken away and partially in cross-section;

FIG. **3** is a partial side elevational view, similar to FIG. **3**, with the inflatable portions deflated;

FIG. **4** is a perspective view of the dental chair apparatus of FIG. **1** shown collapsed in its suitcase sized portable position; and

FIG. **5** is a bottom plan view of the dental chair apparatus in its collapsed position shown in FIG. **4**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, and particularly to FIGS. **1** and **2**, there is shown a dental chair apparatus, generally designated **10**, which generally includes a base assembly **12**, an accordion pleated bellows **14**, a generally rigid seat member **18**, a generally rigid seat back member **20** interconnected therewith, and inflatable cushion members **21–24**, for the support of the head, back, seat and legs, respectively, of an occupant of the chair **10**. Attached to the base assembly **12**, for introducing air into the bellows **14**, is a foot pump **25**; and for releasing air from the bellows **14**, a foot operated air-release control **26**.

As will be described, and referring also to FIG. **4**, the seat member **18** and the seat back member **20** are configured as generally square shallow trays, with the base **12** configured as a somewhat deeper tray, the parts being so dimensioned, arranged and configured, to form, on collapsing or folding, a structurally rigid generally rectangular box-like or suitcase-sized package, generally designated **10'** (See FIG. **4**), of predetermined dimensions, wherein the planar surface of the reverse side of the seat back member **20** is one side of the suitcase thus formed, with the bottom of the base **12** being the opposing side. A suitable handle **11** is affixed to a side wall of the base **12** to facilitate carrying. As will be described, the parts are so formed that the inflatable cushion members **21–24** (in a deflated condition), the bellows **12** (in a deflated condition), and an internal structural support arrangement, are contained within the dimensions of the suitcase **10'** thus formed.

Referring to FIGS. **1** and **2**, and also to FIG. **5**, the base **12** is generally square in bottom plan elevation, and is formed to provide an enclosure or a tray-shaped compartment **30** on the interior thereof, with a peripheral recess on the bottom exterior of the compartment **30**. On the underside, the base **12** is configured for receiving, and has attached thereto, a plurality of generally bar-shaped pivotable outrigger members, or feet, **31–38**.

In the folded or retracted position, the undersides of the feet **31–38** form a plane, along with the generally planar undersurface of the central compartment **30**, and four corner legs **39–42**. The feet **31–38** are pivoted about pivot pins **31***a*–**38***a* positioned in proximity to the legs **39–42**. In the retracted position, the outer edges of the legs **31–38** are coextensive with the outer walls **44–47** of the base **12**. In the extended position shown in FIGS. **1** and **2**, the feet **31–39** extend (as shown also in dotted lines in FIG. **5**) in a direction ninety degrees to the folded position, and serve as outrigger support members, or stabilizers for the weight of the occupant or person in the chair. To facilitate pivoting, the undersurface of the legs **31–38** may be provided with finger gripping recesses **31***b*–**38***b*. The corner leg members **39–42** may be formed as solid block members to provide four-corner vertical weight support for the chair **10**.

The seat member **18** and the seat back member **20** are generally identically configured with generally square generally rigid plate-shaped portions **18***a* and **20***a*, with peripheral side walls **18***b*–**18***e* and **20***b*–**20***e* (not all of which are shown), respectively, with the open part of each of the members in facing relation to form an enclosure for receiving therein the deflated inflatable cushion members **21–24**. The seat member **18** and seat back member **20** are hingedly coupled by a suitable hinge member **48**. The adjacent sides **18***b* and **20***b* of seat member **18** and seat back member **20**, respectively, are interconnected by a pivotably coupled support arm set **50** including arms **50***a* and **50***b*. An identical support arm set **52** arrangement is included on the opposite side with arms **52***a* and **52***b* interconnecting adjacent sides **18***d* and **20***d* of seat member **18** and seat back member **20**, respectively. Referring also to FIG. **6**, the arms **50***a* and **50***b* are formed of metal bar or strap material, with arm **50***a* slightly longer than arm **50***b*. They are pivotably coupled together, such as by a rivet **51** passing through adjacent abutting ends thereof, with a portion of arm **50***a* extending beyond the so-coupled end. This portion has an outwardly extending stop member **50***c* at a position for coaction with the adjacent edge of the arm **50***b* in the pivoted position shown. The opposite end of each arm is pivotally coupled, such as by use of a rivet or screw to the walls **18***b* and **20***b*, of seat member **18** and seat back member **20**, respectively, with the arm sets **50** and **52** thus providing the necessary support for maintaining the seat member **18** at a given angle to the seat back member **20**.

The inflatable cushion members **21–24** may be formed of a suitable plastic material as a unit, that is of one-piece construction similar to an air mattress, with the facing layers of plastic about the edges and along certain lines suitably bonded to form a plurality of air-receiving pockets. A single air valve **19** may be provided for the entire inflatable cushion structure, or individual air valves may be provided for each cushion **21–24** to provide for different amounts of air in each section, and consequently, differing amounts of stiffness or inflexibility for each section. In any event, the rearward surface of the cushion member **22**, and the rearward surface of the cushion member **23** are secured, such as by adhesive to the adjacent surface **20***a* and **18***a*, of the seat back member **20** and the seat member **18**, respectively. In this manner, as shown in FIG. **3**, when the seat back member **20** is opened, or pivoted clockwise as viewed in the drawing relative to the seat member **18**, the head cushion **21** is unfolded clockwise, and the leg support cushion **24** portion is unfolded counterclockwise, after which the cushions may be inflated.

Referring now to FIGS. **1** and **2**, the means for raising and lowering the seat **18** relative to the base **12** will be described. As will be described, the portion of the chair **10** between the undersurface of the planar portion **18***a* of seat member **18** and the open end of base **21** forms a compartment or enclosure, for receiving a bellows **14**, which is attached at its upper end to the undersurface of the seat member **18**. At the lower end, the bellows has the lower peripheral edge thereof attached within the compartment **30** to the base **12**, in airtight relation, and in a manner to be suitably contained, when collapsed, within the side walls **44–47**, that is, the diameter of the bellows **14** is slightly less than the distance between the inner surfaces of an opposing set of walls.

Secured on the interior of the bellows **14**, there is a structural support system, generally designated **58**, which includes a plurality of telescopically interconnected members **58***a*–**58***h*, of stepped dimension, each of which has an inwardly extending peripheral flange at the upper end thereof, and an outwardly extending peripheral flange at the lower end thereof, to permit the members to be received within one another in telescopic relation. The lowermost member **58***a* is generally cup-shaped, and the botom thereof may conveniently serve as the lower surface of the base **12**. The uppermost member **58***h* is of an inverted cup-shaped configuration with the base thereof suitably secured, such as by bolts **57**, to the undersurface of plate-shaped portion **18***a* of the seat member **18**. The members **58***a*–**58***h* may be cylindrical or rectangular in cross-section, and are fabricated to close tolerances to provide a backbone of vertical support for the chair apparatus **10**, that is, the outer dimension of the lower flange portion is closely matched to the inner dimension of the member to which it is connected. Correspondingly, the inner dimension of the upper flange closely corresponds to the outer dimension of the cylinder to which it is connected. In order to prelude rotation of the seat **18**, the members **58***a*–**58***h* are preferably square in cross-section, in which event, the members are self-keyed to one another. Alternatively, the members **58***a*–**58***h* may be cylindrical, with suitable keying means (not shown) formed at the periphery, such as a vertical slot in one member, with a rib or shaft member coacting within the slot to limit the movement of the members relative to one another to a vertical direction. To provide the tightness of fit, while permitting ease of movement in the vertical direction, the cylinders may be conveniently formed of a suitable self-lubricating plastic material, such as Teflon, or Delrin material. In addition, such materials offer lightness of weight. To further facilitate upward and downward movement, some, or all of the members **58***a*–**58***f* may be provided with venting apertures **59**, or one way air valves, not shown, arranged to permit ease of raising the seat **18**, with slight resistance to downward movement without the chair **10** being occupied.

For purposes of filling of the bellows **14** with air, a foot operated pump **25** is provided, interconnected through tubing **25***a* to a valve arrangement **27***a* which passes through the wall **44** into communication with the interior of the bellows **14**. A foot-operated air release control **26** is connected through tubing **26***a* to a valve **27***b* passing through wall **44**. Conveniently, the pump **25** and the control **26** would be on a common plate for ease of use by the dentist. Of, course, the pump **25** may also be used to inflate the cushion members **21–24**.

The material used to make the rigid members **12, 18, 20,** and **31–38** may be any suitable lightweight material, such as fiberglass, high impact plastics, plywood or any combination thereof. Similarly, molded lightweight metal parts of aluminum or magnesium may be judiciously used, in part, with the overall selection of materials thus providing a high strength lightweight, field portable dental chair **10,** which may be readily erected for use, and readily disassembled and folded for transport, all in a suitcase size, such as eighteen inches square by seven inches deep.

Thus it may be seen that the construction, configuration, dimensions, and arrangement of the various components of the chair **10** provide first and second compartments, or enclosures, bounded by generally rigid members, for completely receiving and enclosing therein the flexible or inflatable portions of the chair **10,** along with the flexible bellows **14** being configured for housing the telescopic structural support system **58** on the interior thereof. While there has been shown and described a preferred embodiment, it is to be understood that various other adaptations and modifications may be made within the spirit and scope of the invention.

What I claim is:

1. Chair apparatus collapsible between a first erect position ready for use by an occupant, and a second position in which the parts assume the configuration of a closed box of predetermined dimensions, said apparatus comprising:

first and second generally rigid, generally tray-shaped members coupled and dimensioned to form an enclosure, said first member being configured and dimensioned for forming seat means for an occupant and said second member being configured for providing seat back means for an occupant;

inflatable cushion means contained within said enclosure and operative upon unfolding of said second member relative to said first member and upon inflation of said cushion means to provide bodily support for an occupant;

a generally rigid, generally tray-shaped base portion having an open end dimensionally configured for closure by said first member for forming compartment means;

bellows means within said compartment means operatively attached to said first member and said base portion for enabling adjustable spaced displacement of said first member relative to said open end upon actuation thereof; and

structural support means within said compartment means and within said bellows means and operatively attached to said first member and said base portion for assisting in maintaining the position of said first member relative to said base portion during adjustable spaced displacement of said first member relative to said open end.

2. The apparatus according to claim **1** wherein said structural support means are actuable in response to actuation of said bellows means.

3. The apparatus according to claim **2** wherein said structural support means includes telescopic members within said bellows means.

4. The apparatus according to claim **1** wherein said base portion further includes stabilizing means.

5. The apparatus according to claim **1** wherein said first member, said second member and said base portion are configured and dimensioned to provide a closed box configuration of generally rectangular proportions.

6. The apparatus according to claim **5** wherein said base portion further includes stabilizing means pivotable from a first retracted position within the dimensional limits of the box configuration to an extended posiiton beyond said limits.

7. The apparatus according to claim **6** wherein said stabilizing means are outrigger members pivotable between a closed position and an open position for stabilizing the apparatus, and said base portion is configured for receiving said outrigger members, in the closed position, within said predetermined dimensions.

8. The apparatus according to claim **1** wherein said cushion means are secured within said enclosure to at least one of said first and second members.

9. The apparatus according to claim **1** wherein said cushion means includes a first portion for overlying said first member, a second portion for overlying said second member and a third portion which, when inflated, extends beyond said first member to provide leg support for an occupant.

10. The apparatus according to claim **9** wherein said cushion means further includes a fourth portion which, when inflated, extends beyond said second member to provide head support for an occupant.

11. A portable dental chair apparatus collapsible between a first erect position and a second position in which the parts assume the configuration of a box, said apparatus comprising:

base means for positioning on a supporting surface, said base means including compartment means;

means pivotally coupled to said base means for extending outwardly therefrom for engagement with the supporting surface for providing additional support for said apparatus in said first position;

bellows means having a first end attached to said base means, said bellows means being dimensioned and configured for being contained within said compartment means with said apparatus in said second position;

seat means including a generally rigid portion, said seat means being coupled to the other end of said bellows means, said seat means being raised, lowered, and height adjusted in response to actuation of said bellows means;

means within said enclosure and within said bellows means, collapsible therein with said apparatus in said second position and extendible with said bellows means for providing structural support for an occupant of said apparatus;

seat back means including a generally rigid portion movably coupled to said seat means for adjustable positioning relative thereto, said seat means and said seat back means being configured for forming an enclosure with said apparatus in said second position; and

inflatable cushion means in cooperative relation with said seat means and said seat back means for being inflated to provide support for the head, back, seat and legs of a user with the apparatus in said first position and for being contained within said enclosure with said apparatus in said second position and said inflatable means in the deflated condition.

12. The apparatus according to claim **11** wherein said means within said enclosure and within said bellows means includes telescopically interconnected generally rigid structural support members interconnecting said

base means and the undersurface of said seat means and operably telescoped in response to actuation of said bellows means.

13. The apparatus accfording to claim **11** wherein said means pivotally coupled to said base means are outrigger members pivotable between a closed position and an open position for stabilizing the apparatus, and said base means is a base member configured for receiving said outrigger members, in the closed position, within the dimensions of the box formed by said apparatus in the second position.

14. The apparatus according to claim **11** wherein said inflatable cushion means are secured within said enclosure to at least one of said first and second members.

15. The apparatus according to claim **11** wherein said inflatable cushion means includes a first portion for overlying said seat means, a second portion for overlying said seat back means and a third portion which, when inflated, extends beyond said seat means to provide leg support for an occupant.

16. The apparatus according to claim **15** wherein said cushion means further includes a fourth portion which, when inflated, extends beyond said seat back means to provide head support for an occupant.

17. Portable chair apparatus collapsible between a first erect position ready for use by an occupant, and a second position in which the parts assume the configuration of a closed box of predetermined dimensions, said apparatus comprising:

first and second generally rigid, generally tray-shaped members hingedly coupled and dimesnioned to form an enclosure, said first member being configured and dimensioned for forming seat means for an occupant and said second member being configured for providing seat back means for an occupant;

inflatable cushion means contained within said enclosure and operative upon unfolding of said second member relative to said first member and upon inflation of said cushion means to provide bodily support for an occupant;

a generally rigid, generally tray-shaped base portion having an open end dimensionally configured for closure by said first member for forming compartment means;

bellows means within said compartment means operatively attached to said first member and said base portion for enabling adjustable positioning and spaced displacement of said first member relative to said open end upon actuation of said bellows means; and

structural support means within said bellows means, said support means being operatively attached to said first member and said base portion for extension in response to actuation of said bellow means, said support means and said bellows means conjointly providing support for said first member at any position thereof relative to said base means.

18. The apparatus according to claim **17** wherein said base portion further includes stabilizing means pivotable from a first retracted position within the dimensional limits of the box configuration to an extended position beyond said limits, said stabilizing means being outrigger members pivotable between a closed position and an open position for stabilizing the apparatus, and said base portion is configured for receiving said outrigger members, in the closed position, within said predetermined dimensions.

19. The apparatus according to claim **18** wherein said inflatable cushion means are secured within said enclosure to at least one of said first and second members.

20. The apparatus according to claim **19** wherein said inflatable cushion means includes a first portion for overlying said seat means, a second portion for overlying said seat back means and a third portion which, when inflated, extends beyond said seat means to provide leg support for an occupant.

* * * * *